

REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 1 and 19 are currently being amended. The amendment to claim 19 is formal in nature, and does not change its scope.

Claims 30 and 31 are being added. Support for new claim 30 can be found at least in Figure 1 and the accompanying text. New claim 31 is a method claim corresponding to the device of independent claim 1.

This amendment adds and changes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-31 are now pending in this application.

Allowable subject matter

Applicants appreciate the indication that claims 10, 11, 13-25 and 27-29 contain allowable subject matter. Applicants have not amended claims 10, 11, 13-25 and 27-29, however, because applicants believe that independent claim 1, from which these claims ultimately depend, is allowable.

Rejections under 35 U.S.C. §§ 102 and 103

Claims 1-8 and 12 stand rejected under 35 U.S.C. § 102(b) as being anticipated by JP 57-210207 to Fukuzawa et al. (hereafter "Fukuzawa"). Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Fukuzawa in view of WO 99/13269 to Rostrup-Nielsen et al. (hereafter "Rostrup-Nielsen"). Claim 26 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Fukuzawa in view of U.S. Patent No. 3,580,225 to Coy (hereafter "Coy"). Applicants respectfully traverse these rejections for at least the following reasons.

Independent claim 1 is directed to a hydrogen combustion heater. The hydrogen combustion heater includes a first electric heating catalyst, and a heat exchanger provided downstream of the first catalyst. When electricity is applied to the first electric heating catalyst, the first catalyst is heated thereby starting a first combustion of a first mixture of hydrogen gas and air in the first catalyst. The heat exchanger is adapted to transfer heat generated by the first combustion to a heating medium of the heat exchanger. In contrast to the hydrogen combustion heater as recited in claim 1, the Fukuzawa apparatus fails to disclose at least an electric heating catalyst.

Fukuzawa discloses a mounting method for a catalyst in a catalytic combustion apparatus (see title). Fukuzawa discloses that a mixture of air and fuel 4 flows into the inlet side of a combustion cylinder 9. The combustion cylinder includes a catalyst 6 with a first layer 6a formed of a material having a high activity at low temperature and a second layer 6b, downstream of the first layer 6a, having a high activity at high temperature (see abstract, Figure 2). The combustion cylinder 9 also appears to include a heat exchanger 8 downstream of the catalyst 6.

Fukuzawa, however, does not disclose the catalyst 6, or either of its layers 6a and 6b, to be an electric heating catalyst. To the contrary, the layers 6a and 6b both appear to be combustion catalysts. In this regard the first layer 6a has a high activity at low temperature, suggesting that no electric heating is necessary. The second layer 6b, downstream of the first layer 6a, appears to derive the heat necessary for combustion from the reaction in the first layer 6a. Thus, Fukuzawa appears to disclose an apparatus where both the first layer catalyst and the second layer catalyst are combustion catalysts, not electric heating catalysts.

Moreover, claim 1 also requires that when electricity is applied to the first electric heating catalyst, the first catalyst is heated thereby starting a first combustion of a first mixture of hydrogen gas and air in the first catalyst. Fukuzawa fails to disclose combusting a mixture of hydrogen gas and air. Fukuzawa discloses supplying a mixture of fuel and air, but does not appear to disclose the fuel to be hydrogen gas (see tables 1 and 2 of Fukuzawa). Thus, the apparatus of Fukuzawa works on a very different principle than the heater of claim 1.

Moreover, it would not have been obvious to modify the Fukuzawa apparatus to include a first electric heating catalyst. The first layer 6a of Fukuzawa, having a high activity at low temperature, appears to be intended to operate based on the temperature of the mixture of fuel and air, and thus would not require electric heating.

Rostrup-Nielsen fails to suggest that the Fukuzawa apparatus should be modified to include an electric heating catalyst. Rostrup-Nielsen is directed to an electrically-heated combustion catalyst structure and method for start-up of a gas turbine engine (title). Rostrup-Nielsen, however, does not disclose using an electrically-heated combustion catalyst for providing heat to a heat exchanger. Moreover, it would not have been obvious to have substituted the electrically-heated combustion catalyst for the catalyst of Fukuzawa, as discussed above, because Fukuzawa suggests that the first layer 6a of the catalyst is intended to operate based on the temperature of the mixture of fuel and air, and would thus would not require any electric heating.

Even if Rostrup-Nielsen and Fukuzawa could be properly combined (which they cannot), the result would not meet the limitations of claim 1. As discussed above, claim 1 also requires that when electricity is applied to the first electric heating catalyst, the first catalyst is heated thereby starting a first combustion of a first mixture of hydrogen gas and air in the first catalyst. Rostrup-Nielsen discloses combusting hydrocarbonaceous fuel/oxygen-containing gas (page 5, lines 9-14), not hydrogen gas. Thus, even if Rostrup-Nielsen and Fukuzawa were combined, the result would not meet the limitations of claim 1.

Coy was cited for allegedly disclosing a heater for heating water from combustion gases and also fails to cure the deficiencies of Fukuzawa and Rostrup-Nielsen.

For at least the above reasons, independent claim 1 is patentable over Fukuzawa, Rostrup-Nielsen and Coy. The dependent claims, ultimately dependent from claim 1, are patentable for at least the same reasons, as well as for further patentable features recited therein.

New method claim 31 has been added. Claim 31 recites “applying electricity to said first catalyst to heat said first catalyst and to thereby start a first combustion of a first mixture

of said hydrogen gas and said air in said first catalyst; and transferring heat generated by said first combustion to a heating medium of a heat exchanger provided downstream of said first catalyst in said passage.” Applicants submit that new claim 32 is patentable for at least the same reasons as claim 1, discussed above.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date January 14, 2004

FOLEY & LARDNER
Washington Harbour
3000 K Street, N.W., Suite 500
Washington, D.C. 20007-5143
Telephone: (202) 945-6162
Facsimile: (202) 672-5399

By Thomas G. Bilodeau

Pavan K. Agarwal
Attorney for Applicant
Registration No. 40,888

Thomas G. Bilodeau
Attorney for Applicant
Registration No. 43,438